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Reduction of crosstalk in surface electromyogram by optimal spatio-temporal filtering

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Crosstalk can pose limitations in the applications of surface electromyogram (EMG). Its reduction can help in the identification of the activity of specific muscles. The selectivity of different spatial filters was tested in the literature both in simulations and experiments, but their performances are affected by many factors (e.g., anatomy and dimension/location of the electrodes). Moreover, they reduce crosstalk by decreasing the detection volume, recording data that represent only the activity of a small portion of the muscle of interest. In this study we propose an adaptive approach, which filters both in time and among different channels, providing a signal that maximally preserves the energy of the EMG of interest and discards that of nearby muscles (increasing the signal to crosstalk ratio, SCR). Tests with simulations and experimental data show an average increase of the SCR of about 2 dB with respect to the SD or DD data processed by the filters. The method is applied to few signals, proving its potential in applicative studies (e.g., clinics, gate analysis, and prosthesis control) where a limited number of non-selective channels are used.

Biography

Luca Mesin has done his Master's degree in Electronics Engineering in 1999 and PhD in Applied Mathematics in 2003. He is an Associate Professor in Biomedical Engineering at Polytechnic University of Turin, Italy. He is the Head of the research group on Mathematical Biology and Physiology. His research activities are devoted to the processing of signals or images extracted from biological and physiological systems and to the development of mathematical models for the interpretation of the recorded data. Applications are mainly focused on the investigation of biological systems or on the development of new biomedical tools. Recent works concern the simulation of spiral waves using a model of electromechanical coupling in the heart, the investigation of the central venous pressure, the processing of multiple data reflecting the responses of the autonomous nervous system and the simulation and processing of bioelectric signals.

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